south; whilst *H. ferrugineus* is a species peculiar to the east of Europe, which is still found, though very rarely, in Denmark and at the Rhine, but not in England. In "Möens klint," and the neighbourhood of Silkeborg in Jutland, several species are found which elsewhere are confined to mountains, although the said localities are only 400–600 feet above the surface of the sea: amongst the *Harpalini*, this is the case with *Ophonus azureus* and *Harpalus seriepunctatus*.

The species having all been described before, new descriptions are given only of a few. The characters, however, by which Prof. Schjödte proposes to arrange them into groups are indicated (in Latin); of the genera new and excellent descriptions are given, and a synoptical table at p. 153. The Danish *Harpalini* belong to *Anisodactylus*, *Diachromus*, *Ophonus*, *Harpalus*, *Bradycellus*, *Acupalpus*, *Stenolophus*, and *Balius*, a new genus founded on *Stenolophus conspectus* and a very similar species from Bengal, distinguished by the remarkable shape of the ligula*. Prof. Schjödte further proposes the establishment of a new group within the limits of the *Harpalini*, which he proposes to call *Stenolophini*, and characterizes by the structure of the maxillæ, of which the stipites are prolonged into a remarkable tooth reaching beyond the first joint of the maxillary palpi. In this group Prof. Schjödte comprises a series of small *Harpalini* "spread over the whole earth, and not less so in the scientific systems." Besides *Balius*, *Stenolophus*, and *Acupalpus*, he mentions *Daptus*, *Batoscelis*, and *Agonoderus*. Among these, *Daptus* and *Batoscelis* are adapted for a manner of living similar to that of the *Scaritini*; and many entomologists would probably place them near this group on account of their thick heads, broad anterior tibiæ, linear tarsi, &c. Prof. Schjödte, however, urges that these so-called "biological" characters do not indicate a real affinity between all the *Carabi* which exhibit them, but only an analogous mode of life. The structure of every animal is no doubt closely adapted to its habits; and in so far every peculiarity of structure, and the systematic characters derived from it, might, in some sense of the word, be called biological. But it is only to a small extent that we can indicate the connexion between habits of life and structure; and, as our knowledge stands at present, every animal and every group of animals appear to us as exhibiting the general feature of some type quite arbitrarily devised by the Creator, and modified in some respects to serve certain purposes. The true conception of these types, of higher and lower order, is the first condition of a natural system; but in this respect great faults have been committed. One great cause of mistakes is that analogous modifications of the corresponding organs in animals really belonging to different though allied types, but living under analogous external circumstances, have often been erroneously considered as the peculiar characteristics of a type—or, in other words, analogies have been mistaken for affinities. Thus, in the case before

* What is called ligula in *Carabi*, *Dytisci*, and *Gyrini*, is, strictly speaking, only the fulcrum ligulæ, the true ligula being represented by the "paraglossæ."

us, most *Carabi* adapted for digging in the ground undoubtedly belong to the same natural group—*Scaritini*; but this is not the case with all. Some genera also of other groups are adapted for this manner of living by the shape of their heads, their prothorax, antennæ, and legs, without on that account separating themselves from the group to which they naturally belong. *Daptus* and *Batoscelis* amongst *Stenolophini*, *Ditonus*, *Acinopus*, and others amongst the other *Harpalini*, are in this case. But then the whole set of characters which have reference to this manner of living cannot any longer be considered as the exclusive mark of distinction of any particular group.

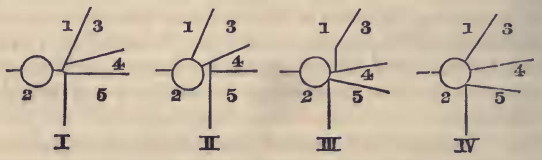
Prof. Schjödte's paper is rich in hints towards a better systematic arrangement of this numerous family than the present one, amongst which we will only mention the peculiar structure of the mouth in *Amblystomus*, *Barysomus*, and *Cyclosomus*, whose paraglossæ, being very broad, unite in front of the ligula.

In connexion with the preceding, a few words may not be out of place with reference to Prof. Schjödte's other contributions to the history of the *Carabi*. Much valuable information on this subject is to be found in his 'Denmark's Eleutherata' *, a work which is much less known than it deserves to be. In the second volume of the second series of the 'Naturhistorisk Tidsskrift,' p. 346, there is an interesting treatise on two new *Carabi* from Guinea,—*Hiletus versutus*, which forms the type of a separate group, and *Ochyropus gigas*, which belongs to *Scaritini*, but is remarkable for its long legs and vigorous feet. To the description of these species the author adds a number of highly interesting remarks on the systematic value of certain structural modifications of the thorax, of the position and shape of the antennæ, as well as of the different modifications to which the neighbouring parts of the head are subject, corresponding to the peculiarities of the antennæ. In the 'Proceedings of the Royal Danish Society' for 1855, he reverts to the subject; and the principal results embodied in these papers may be shortly recapitulated in the following manner.

In all *Carabi* the principal part of the epimera metathoracica is covered by the elytra, and is therefore quite membranaceous; but in very many there is an appendix to the said pieces, which descends towards the haunches, and is visible on the ventral surface. These appendices coalesce more or less with the episterna metathoracica, and appear to a superficial observer as belonging to them; hence *Carabi* presenting this structure have formerly, both by Schjödte and others, been described as having episterna metathoracica appendiculata, although it ought to be epimera metathoracica appendiculata. It is by comparison with other Coleoptera where the epimera are less completely covered than in *Carabi*, that Prof. Schjödte has learned the real nature of these appendices. The existence or want of these pieces is of great systematic value. In the family *Carabini* it

* Denmark's Eleutherata, I. (*Carabi*, *Dytisci*, *Gyrini*). Copenhagen, 1840–42. 25 tables, with analytical drawings.

may be advantageously combined with the shape of the tibiæ anteriores. They are wanting in *Cicindelini, Carabini, Elaphrini, Scaritini**, and in the more isolated genera *Siagona* and *Enceladus*. Of these, *Scaritini* distinguish themselves from the others by having a deep incision on the outer edge of the two anterior tibiæ, of which one of the terminal spines of the tibiæ is removed. All the others have either no incision or only a small one, and both terminal spines in their proper place. *Hiletus*, Schjödte, combines this last character with the existence of appendices to the epimera metathoracica, whilst all the other *Carabi* which have not been here mentioned combine the existence of an incision in the two anterior tibiæ, carrying one of the terminal spines, with appendiculated epimera. Another point in the structure of the thorax has perhaps in some respects been observed, though not clearly expressed, by the American entomologist Leconte, namely, the formation of the sockets of the second pair of legs. Five pieces may participate in the formation of each of these sockets: 1, mesosternum; 2, metasternum; 3, episternum mesothoracicum; 4, epimerum mesothoracicum; and 5, episternum metathoracicum, of the corresponding side. There exist four combinations: the sockets are formed (1) by mesosternum and metasternum alone; (2) by mesosternum, metasternum, and episterna mesothoracica; (3) by mesosternum, metasternum, and epimera mesothoracica; (4) by mesosternum, metasternum, episterna, and epimera mesothoracica. In the third and fourth cases a small continuation from the episterna metathoracica sometimes takes part in the formation of the sockets. These four combinations may be represented as in the subjoined diagrams, the numbers indicating the pieces in the order they are mentioned above †.



* In some *Scaritini* the epimera metathoracica present a linear impression near the margin, which may be, and has been, mistaken for a real suture; and the piece thus isolated has been mistaken for the appendices of which we speak.

† Proc. Royal Soc. of Copenhagen, 1855, p. 360. In this place, Prof. Schjödte has communicated various observations, *e. g.* on the new *Niphargus aquilex*, and on *Broscosoma* and *Miscodera*, which he shows are so nearly related that, instead of belonging to different groups of *Carabi*, as some think, they are both true *Harpalini*, and would form only one genus if there were not some difference in the construction of the chin and in the shape of the epimera mesothoracica, which are triangular in *Miscodera* and linear in *Broscosoma*. It is in so far as Leconte has attended to the shape of these pieces that he may be said to have been on the track of Prof. Schjödte's beautiful observation; but he has not penetrated the matter, and Prof. Schjödte avails himself of the opportunity to show how unnatural

For want of sufficient material, Prof. Schjödte has not carried out through all the families the systematical results to which a proper consideration of these characters would lead; he only indicates that the family of *Carabi* may thereby be divided into two natural divisions, and that throughout the order Coleoptera they are valuable as characters of families and groups. There can be no doubt that by this discovery a very important step has been made towards the better arrangement of the Coleoptera.

In the paper on *Hiletus* and *Ochyporus* (in the second series of the 'Tidsskrift,' p. 376), Prof. Schjödte has drawn attention to the differences exhibited by the *Carabi* as to the place of insertion of the antennæ and the corresponding modificatious in the surrounding parts. The following are the principal variations. I. The antennæ may be inserted in the sides of the forehead over the mandibles. The basal joint (scapus) of the antennæ is then generally very long, and a little curved so as not to interfere with the eye when the antennæ are kept quite close to the body, which operation is also facilitated by the socket of the second joint (pedicella) being turned a little backwards. This is the case in *Cicindelini*, and forms a new mark of distinction for this group, which has since also been observed by Leconte. In *Collyris* and *Euprosopus*, each of the cheeks presents a sharp groove under the eye, for the reception of the third joint of the antennæ, which is shaped accordingly. In *Manticora* the basal joint is unusually short, and there is a groove for it closely behind the point of insertion of the antennæ. II. In all other *Carabi* the antennæ are inserted in the cheeks, between the root of the mandibles and the eye, almost every genus exhibiting a peculiar arrangement. In some (as, for instance, in *Anthia*) the cheeks extend so far in all directions that there are no obstructions to the free movements of the antennæ, in which cases therefore no special modifications of the surrounding parts are necessary. In other cases (e. g. *Mormolyce, Helluo, Galerita, Drypta*) the cheeks are so long, and at the same time so much extended to the sides, as to present an anterior surface outside the mandibles, in which the antennæ are inserted. If so, there is sometimes a groove in the mandibles, in order to facilitate the antennæ being turned forward, whilst the opposite movement is often facilitated by a deep groove prolonging the socket backwards. If the cheeks are short without great breadth, similar grooves in the mandibles and in the cheeks, in infinite variation, constantly occur. Finally, in those which are destined for digging under ground (*Scaritini, Acinopus, Broscus*, &c.), or for living under bark (*Silphomorpha*), or other similar modes of existence (*Hiletus*), the cheeks are short, but extend considerably downwards (owing to

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Leconte's classification often becomes because of his blind adherence to the mere differences of shape exhibited by these pieces. Prof. Schjödte further refutes his erroneous statement that *Brachinini* alone have seven abdominal joints, but all other *Carabi* six; the seventh joint is found in all *Carabi*, only in many it is retracted under the sixth (*vide* also Denm. Eleutherata, 361, and Germar, Zeitschrift f. Entomologie, v. 476).

the thickness of the head), the bases of the antennæ are often protected by the prominent corners of the forehead, the antennæ geniculated, and two foveæ antennales provided. Taking all this into consideration, Prof. Schjödte has, in the 'Proceedings of the Royal Society of Copenhagen' (*loc. cit.*), proposed the following distribution of *Carabi*:—

I. Epimera mesothoracica coxas inferius attingentia.

A. *Epimera metathoracica appendice exteriori nulla.*
1. Antennæ frontales.
1. Cicindelini.
2. Antennæ pone mandibulas genis insertæ.
a. Antennæ scrobiculis haud recipiendæ, basi detectæ.
2. Carabini (inclus. Elaphrini cum gen. *Loricera*, Latr., et *Migadops*, Wath.).
b. Antennæ scrobiculis recipiendæ, sæpissime fractæ.
* Antennæ basi detectæ. Tibiæ inermes (mentum concretum; epimera mesothoracica concreta).
3. Siagonini (*Siagona*, *Enceladus*).
** Antennæ basi lamina frontali supertectæ. Tibiæ anticæ palmatæ.
4. Scaritini.

B. *Epimera metathoracica appendice exteriori instructa.*
a. Antennæ basi lamina frontali supertectæ, scrobiculis recipiendæ. Tibiæ anticæ integræ.
5. Hiletini (type *Hiletus*, Naturh. Tidsskr. *l. c.*).
b. Antennæ basi detectæ, scrobiculis haud recipiendæ. Tibiæ anticæ emarginatæ.
6. Ozænini (types *Ozæna*, *Myrtropomus*, *Mormolyce*).

II. Epimera mesothoracica coxas inferius haud attingentia.
Tribus Caraborum ceteræ.

It is to be hoped that Prof. Schjödte will find an opportunity for carrying out in greater detail these new ideas, which certainly seem to promise very useful systematic results.

To return to the volume before us: it should be noticed that it contains four excellent plates illustrating a paper by the editor on the metamorphoses of Coleoptera, with drawings and analyses of the larvæ of *Gyrinus marinus*, *Hydroïus aterrimus*, *Hydrophilus caraboïdes*, *Hydrobius fuscipes*, *Philhydrus testaceus*, and *Berosus spinosus*. In the following part this treatise will be continued, and we shall then have an opportunity for a few observations on it.

The North-Atlantic Sea-bed; comprising a Diary of the Voyage on board H.M.S. Bulldog, in 1860, *and Observations on the Presence of Animal Life, and the Formation and Nature of Organic Deposits, at great Depths in the Ocean.* By G.C. Wallich, M.D., F.L.S., F.G.S. &c. Part I. 4to. London: Van Voorst, 1862.

In this work Dr. Wallich, who held the office of Naturalist to the Expedition dispatched in 1860 to survey the proposed telegraphic route between this country and America, gives us the results of his investigations into the natural history of the portion of the sea-bed

passed over by the 'Bulldog' during her voyage of about four months. The first section of the part now before us contains his journal of the voyage, which comprises much interesting information, especially upon the nature and mode of formation of the icebergs and ice-fields which constitute at once the greatest wonder and the chief danger of those northern seas in which his investigations were carried on. This portion of Dr. Wallich's book we shall, however, pass over, in order to direct the reader's attention more particularly to the remarkable results detailed in the second section, which is devoted to the consideration of the "Bathymetrical Limits of Animal Life in the Ocean."

The interest attaching to this section of Dr. Wallich's work arises from the fact that, in some of his deep-sea soundings, the apparatus employed brought up living animals from those abysses of the ocean which, according to the almost universal opinion of naturalists, were uninhabitable by any creatures, thus at once upsetting all our preconceived notions as to the distribution and limits of animal life in the sea. The first notice of Dr. Wallich's remarkable observations appeared in this Journal in December 1860; in the present work we have a more detailed account of the mode of occurrence of the animals referred to, which can leave no doubt that the existence of animal life at enormous depths is an actual fact.

The most striking of Dr. Wallich's results was obtained in a sounding at a depth of 1260 fathoms: it is to this that his short paper already alluded to refers. The deposit brought up consisted of *Globigerinæ*, many of them in a fresh condition, amongst which were some small Serpuloid tubes, composed chiefly of the shells of small *Globigerinæ* cemented together, from which Dr. Wallich justly concludes that the inhabitants of these tubes live upon the sea-bed among the *Globigerinæ*. But the most astonishing circumstance was the occurrence of numerous living Starfishes of a species (*Ophiocoma granulata*) well known as an inhabitant of our coasts, adhering to the sounding-line under such conditions as to prove that they also must find a suitable dwelling-place in the profound abysses of the ocean. The evidence of this fact is furnished partly by their position on the line, and partly by the contents of the stomach of a specimen opened by Dr. Wallich. To explain the former proof, our author tells us that, after the regular operation of sounding had been performed, the apparatus for bringing up a portion of the bottom was lowered, and, in order to make sure of its reaching and dragging on the bottom, about fifty fathoms of line were paid out in addition to the quantity indicated by the previous sounding. It was only to this fifty fathoms of line, which must have lain along the bottom of the sea, that the Starfishes adhered; and as no fewer than thirteen of them were brought up, it would appear that they must be tolerably plentiful over the sea-bed at the point sounded. The contents of the stomach proved that the *Ophiocomæ* feed upon the *Globigerinæ*, furnishing additional evidence that the two forms were cohabitants of the sea-bottom at this point.

Dr. Wallich refers to other instances in which he obtained living animals, and indications of the existence of other forms, from depths

greater than are usually supposed favourable to animal life: the *Globigerinæ*, he states, are obtained from the immense depth of 3000 fathoms, and from no less than 1913 fathoms the small Annelid-tubes above referred to as fabricated of the shells of *Globigerinæ* were brought up. He also cites analogous observations made by various investigators, amongst others by Sir John Ross and Sir James Clark Ross, the former of whom even obtained a Gorgon's-head Star-fish (*Euryale*) adhering to his sounding-line at a depth of 800 fathoms, whilst M. Torell, director of the Swedish expedition to Spitzbergen, is reported to have brought up from 1400 fathoms a "Crustacean of bright colours." Dr. Wallich does not, however, refer to the examples adduced by Dr. A. Milne-Edwards in July 1861, before the Academy of Sciences of Paris (see Annals, Sept. 1861), of the occurrence of several species of Mollusca, Corals, *Serpulæ*, and Polyzoa, found adhering to a submarine cable recovered from depths between 1000 and 1500 fathoms in the Mediterranean.

Having proved experimentally that animals do live at vast depths in the ocean, our author reviews the grounds upon which the opposite opinion, to which he gives the title of *antibiotic*, has been founded. He discusses in detail the various questions connected with the temperature and aëration of the water, and the presence in it of mineral and other substances necessary for the existence of the animal forms which have been found in the deepest recesses of the ocean, and, it appears to us, shows satisfactorily that the views hitherto entertained upon these points are erroneous. The argument derived from total absence of light at these great depths is disposed of by reference to the well-known fact that the lower parts of the deep-sea coral zone of Forbes, which are inhabited by numerous and often brightly coloured animals are situated far below the depth (700 feet) to which the smallest amount of light can penetrate. One main reason which has been urged against the existence of any living thing in the deep sea, namely, the enormous pressure which must prevail towards the bottom, appears to offer no further difficulty. Immense as this pressure must be, amounting to no less than 2640 lbs. on the square inch at a depth of a mile, Dr. Wallich shows that, as every part of the creatures living at the sea-bottom is "completely pervious to fluids, either by its porosity or through endosmotic action, the state of equilibrium remains undisturbed," and thus these animals will be enabled to adapt themselves to all circumstances of pressure.

There is one point, however, in connexion with the residence of animals at great depths, in which Dr. Wallich seems to find some difficulty, namely, the mode in which they can obtain their nourishment. Vegetable substances, in the sea as on land, must be considered to form the basis of the nutrition of animals, either directly or indirectly; but the growth of plants is limited to those zones of the sea-bed to which light can penetrate; and although the remains of vegetable organisms have been brought up in abundance from great depths, their condition seems to prove that their life was passed nearer the surface of the ocean, and that they did not sink to the bottom of the deep waters until after the cessation of their vitality. That

the nutrition of the Starfishes and Annelides may be effected at the expense of the *Globigerinæ* and other low forms of animals is shown by the contents of the stomach of one of the Starfishes when brought to the surface; the question then is, in what manner are these lower organisms nourished? In endeavouring to find a solution of this problem, Dr. Wallich puts forward a hypothesis which we cannot think to be at all admissible, namely, that as the organisms in question possess the power of "separating carbonate of lime or silica from waters holding these substances in solution . . . . . they may also apply the elements not needed for that purpose to the nutrition of their soft parts, especially since the remaining elements are those which, when united, constitute the proteine-compound of which their soft parts are invariably composed." In this Dr. Wallich thinks that "no exceptional law is invoked;" but it seems to us that, even if the derivation of mineral elements, such as carbonate of lime and silica, directly from the surrounding water be, as Dr. Wallich considers it, an indisputable fact, it still furnishes us with no analogy to the fixation and combination of the organizable elements into a living body, as the carbonate of lime and silica remain unchanged in their chemical condition; whilst the analogy supposed to exist with plants is still further from the truth. The very difficulty which this hypothesis is proposed to get over arises from the fact, admitted by Dr. Wallich, that plants, which we know to derive their nourishment from inorganic matter, cannot effect the assimilation of the necessary elements without the stimulus of light; and yet we are to assume that animals, none of which, as far as we know, are capable, under the ordinary conditions of plant-life, of availing themselves of the surrounding elements for the nutrition of their bodies, may yet do so under the influence of a total absence of all recognizable stimulus. It appears to us, that in this we have an invocation of a very exceptional law, and one which involves something very like a creation of force. A statement made by Dr. Wallich, a few pages after the promulgation of the above theory, may perhaps serve partly to explain the apparent anomaly. He says, "it is evident that there is an intimate association between the Globigerina-deposits and the Gulf-stream; for wherever we trace the one sweeping across the surface of the ocean, we are almost sure to detect the other resting on the sea-bed; and when we fail to trace the one, we almost as surely fail to detect the other." This connexion between the Gulf-stream and the deposits of *Globigerinæ* is ascribed by Dr. Wallich to the vast quantities of carbonate of lime brought down into it by the great rivers of the American continent. The abundant supply of this salt is considered to be so favourable to the growth of Foraminifera as to cause their abundance along the course of the Gulf-stream. Admitting the force of this argument, may not the influence of the Gulf-stream depend also in part, perhaps chiefly, on the vast numbers of organisms which swarm in its genial waters, and which, sinking to the bottom after death, may furnish the food necessary for the sustenance and multiplication of the inhabitants of the abysses beneath them?

Although constrained to dissent on this point from Dr. Wallich's

views, we nevertheless cordially welcome his work as a most important and interesting contribution to our knowledge of the physical geography of the sea. The reader will find in it a most interesting discussion of some of the most important questions connected with the distribution of marine animals; and many of the statements connecting these with the elucidation of facts in geology and physical geography will be found exceedingly valuable. We look forward with much impatience for the appearance of the second part, completing the work (which is announced to be published in December), as it will contain the results of Dr. Wallich's investigations into the structure and life-history of the Rhizopodal Fauna of the deep sea; and from the care with which his researches have been carried on, we have every reason to expect a highly valuable contribution towards the history of those singular creatures. This portion of his subject is barely commenced in the part before us; but, from the few pages here devoted to it, and the lettering of the beautiful plates appended to the work, nearly all of which illustrate the Rhizopoda, it would appear that Dr. Wallich's researches have led him to important systematic results.

On the various Contrivances by which British and Foreign Orchids are Fertilized by Insects, and on the good effects of Intercrossing. By Charles Darwin, M.A., F.R.S. London: John Murray. 12mo. 1862.

Among flowering plants there are few which excite our interest more than the Orchids, whether we consider merely the singularities of their external appearance, or the mysterious amalgamation of their male and female organs in a single central column. The strange and often grotesque forms of the flowers (simulating, as they frequently do, certain members of the animal kingdom), the great beauty of some species, and the remarkable epiphytal habits of others are quite sufficient to attract the attention of both the botanist and the horticulturist to these plants; and when we add to this that the above-mentioned amalgamation of the sexual organs of the flowers, instead of facilitating impregnation, as might have been expected, really seems to place obstacles in the way of the performance of this function, the interest excited by these plants will reach its climax. It is Mr. Darwin's object in the present work to clear up the mystery hanging over the process of impregnation in the Orchids, in order to apply the results thus obtained to the support of certain opinions advanced in his book on the 'Origin of Species.' In the practical part of his task, the explanation of the mode of fertilization, it seems to us that he is completely successful; but whether the arguments deduced therefrom on the general question be equally valid, is another affair.

It has long been supposed by some botanists, amongst whom Mr. Darwin cites Sprengel and Robert Brown, that in the fertilization of Orchids insects play a not unimportant part; but, as remarked by our author, from their assuming the pollen to be applied to the im-

pregnation of the same flower, they have missed discovering the true process. According to Mr. Darwin, the pollen of one flower is almost invariably employed to fertilize the seeds of another; and the contrivances by which this end is attained in different Orchids appear to us to be amongst the most remarkable presented by the vegetable kingdom. We may select one of the simplest forms of the process, namely that exhibited by *Orchis mascula*, as this will furnish a clue to the phenomena presented throughout the group.

In this plant the top of the column is occupied by the single anther, containing two pollinia or masses of pollen-grains, which are produced beneath into small slender stalks, each terminating in a viscid disk which is received into the back of the rostellum. The latter, which is the homologue of one of the stigmata, projects from the front of the column in such a manner as partially to fill up the orifice leading into the nectary, and on each side of it are the true stigmatic surfaces of the remaining two stigmata. The viscid disks of the pollinia are surrounded by a fluid which keeps them constantly moist, being protected from atmospheric influences by the rostellum. The action of this complex apparatus is explained, as follows, by Mr. Darwin:—

"Let us suppose," he says, "an insect to alight on the labellum, which forms a good landing-place, and to push its head into the chamber at the back of which lies the stigma, in order to reach with its proboscis the end of the nectary..... Owing to the pouch-formed rostellum projecting into the gangway of the nectary, it is scarcely possible that any object can be pushed into it without the rostellum being touched. The exterior membrane of the rostellum then ruptures in the proper lines, and the lip or pouch is most easily depressed. When this is effected, one or both of the viscid balls will almost infallibly touch the intruding body. So viscid are these balls that whatever they touch they firmly stick to. Moreover the viscid matter has the peculiar chemical property of setting, like a cement, hard and dry in a few minutes' time. As the anther-cells are open in front, when the insect withdraws its head, one pollinium, or both, will be withdrawn, firmly cemented to the object, projecting up like horns. The firmness of the attachment of the cement is very necessary, as we shall immediately see; for if the pollinia were to fall sideways or backwards, they could never fertilize the flower. From the position in which the two pollinia lie in their cells, they diverge a little when attached to any object. Now let us suppose our insect to fly to another flower:..... by looking at the diagram, it will be evident that the firmly attached pollinium will be simply pushed against or into its old position, namely into its anther-cell. How, then, can the flower be fertilized? This is effected by a beautiful contrivance: though the viscid surface remains immovably affixed, the apparently insignificant and minute disk of membrane to which the caudicle adheres is endowed with a remarkable power of contraction, which causes the pollinium to sweep through about 90 degrees, always in one direction, viz. towards the apex of the proboscis, in the course, on an average, of thirty seconds. Now, after